EPA Watershed Initiative Grant Program

Charles River Watershed Plan

Proposal

Submitted to:
US Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue NW
Washington, DC 20460

Submitted by:
Charles River Watershed Association
2391 Commonwealth Avenue
Newton, Massachusetts 02466

21 November 2002

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APPENDICES

1. Characterization of the Watershed and Watershed Planning Effort

Description of Watershed and Problems. The Charles River watershed drains 308 square miles in eastern Massachusetts and includes some 80 brooks and streams and several aquifers (Appendix D). The Charles twists and turns on an 80-mile course, eventually discharging to Boston Harbor. Because the river meanders through 23 communities, its management is politically complex. An estimated 20 species of fish live in the Charles, including two anadromous species, the Alewife and the Blueback Herring. The habitat of these fish is adversely affected by a series of 20 dams, by water withdrawals for water supply to upper watershed communities and by pollutants. Boats ranging from powerboats to sailboats and from rowing shells to wind surfers crowd the Charles. The Metropolitan District Commission's Charles River Reservation hosts more visitors than any other riverfront park in the nation and includes Boston's famous Esplanade, site of the city's 4th of July fireworks.

In 1994, the Charles River Watershed Association (CRWA), an environmental non-profit with a mission to protect and enhance the Charles River and its tributaries, began its Integrated Monitoring, Modeling and Management (IM3) Project, the first comprehensive study of water quality, flow, biota, and land use in the Charles River watershed. It involved the cooperative efforts of many stakeholders, including EPA–Region 1. With the science from the IM3 Project as the impetus, EPA–Region 1 launched its ambitious effort in 1995 to restore the Charles River so it would be fishable and swimmable by Earth Day 2005. Graded for its compliance with state bacterial water quality standards for swimming, the river received a "D" in 1996, the first year of the river's "Report Card." Since then, combined sewer overflows (CSOs) have been reduced or eliminated and over one million gallons per day of raw sewage discharging to the river have been removed. Along with EPA's summer water quality monitoring, CRWA's ongoing monthly water quality monitoring has provided the basis for EPA's Report Card and has led to the identification and removal of several other discharges of sewage.

The cooperative effort and environmental gains in the Charles River watershed have been promoted as a model of success by national environmental organizations such as River Network and

Natural Resources Defense Council. Perhaps most importantly, EPA has featured the successes of the Charles watershed program as an example in President Bush's Watershed Initiative.

But, **the Charles River story is not over**. There is still much work to do before it will be clean enough for swimming and fishing. Improvements have plateaued. Long-term monitoring conducted by CRWA shows that water quality in the river continues to suffer from pollutant-laden discharges that cause widespread violations of the Massachusetts Surface Water Quality Standards. CSOs, while smaller in number and in volume, continue to discharge to the river's Lower Basin.

Sustaining river flow is also of serious concern. Communities in the rapidly growing upper Charles River watershed rely on local aquifers for water supply and regularly face watering bans starting as early as March and running through October. Increased development in the Charles causes increased water demand, increased impervious surfaces, and decreased infiltration. Consequently, the entire river suffers from low flows, raised temperatures, lower dissolved oxygen levels, increased concentrations of nutrients and other pollutants, accelerated eutrophication, the conversion of wetlands to uplands, and decreased riverine and riparian habitat.

Description of the Watershed Plan. The work described in this proposal is part of an overall watershed plan to produce results in: water quality, river flow, fisheries, habitat, sediment quality, and public education and involvement. CRWA, with partners U.S. Environmental Protection Agency, Massachusetts Executive Office of Environmental Affairs (EOEA), Massachusetts Department of Environmental Protection (DEP), U.S. Geological Survey (USGS), MA Division of Fisheries & Wildlife (DFW), U.S. Army Corps of Engineers, municipalities, businesses, and citizens, will be responsible for implementing the watershed plan and obtaining results. Specific responsibilities and commitments by these partners are described later in this proposal.

The plan's highest priority includes developing Total Maximum Daily Loadings (TMDLs) for the Lower Basin and the upper watershed, including the investigation of flow trading as a means to increase aquifer sustainability and reduce pollutant concentrations in the river by reducing impervious

surfaces and promoting groundwater recharge and flow. Other plan elements, prioritized below, include determining a target fish assemblage, reducing polluted stormwater runoff, increasing groundwater recharge, removing illicit discharges, and promoting public education and watershed use. Demonstration projects aimed at implementing change and producing results are critical to the plan and will include installation of CRWA's new SmartStorm™ rainwater collection system, and application of an innovative DNA database project to determine sources of fecal contamination. Outreach and educational efforts will include public and municipal stormwater education and control programs and a flagging system promoting recreational access and education.

The above plan elements would be funded all or in part with requested funds, or are described in this proposal as a match. Other projects critical to restoration of the Charles River but not included in this proposal are re-design and construction of the New Charles River Dam fish ladder, and removal or remediation of contaminated sediments in the Lower Basin. The U.S. Army Corps of Engineers, in cooperation with EPA, the state, and USGS, is actively pursuing these projects.

Short-term goals (0 to 3 years) of the Charles River watershed plan include: reduce polluted discharges, increase recharge of rainwater, develop a target fish community, promote public education, and prove the efficacy of innovative demonstration projects. Long-term goals (3+ years) of the plan include: produce a fishable and swimmable river, restore river baseflow, improve fisheries habitat and access, continue public education, and continue coordination of project partners.

2. Description of the Proposed Projects

This plan is consistent with, and supports the mandate of, both EPA's Clean Charles 2005 Task Force and EOEA's Watershed Initiative. Projects were designed in consultation with both groups and will directly benefit the groups' collaborative initiatives. All project partners are ready to begin work. In fact, several organizations have already written scopes of work or otherwise laid the groundwork for this next stage in the Charles River restoration. While many of these projects are underway, requested funds will fill critical gaps. We expect measurable, replicable results within two years.

To monitor and evaluate the success of the projects and watershed plan, we propose to measure the bacteria and total suspended solid levels in the river; quantity of stormwater removed or treated; quantity of untreated sewage or illicit connections detected and removed; the reduction in potable water demand; the amount of rainwater recharged to the ground; observed improvement in fish access, habitat, or population; and the applicability of innovative demonstration projects to other regions of the country. Performance measures will be applied on a quarterly basis, and we will use them collectively to determine overall river improvement.

Lower Basin Eutrophication Total Maximum Daily Loading (TMDL). EPA and CRWA are leading the effort to develop the Eutrophication TMDL for the Lower Basin of the Charles. Consultants, TetraTech and Numeric Modeling, will configure a water quality model for the Lower Basin using $2+ million dollars of studies and tools developed since 1998 and additional data from EPA and CRWA. When the model has been calibrated and verified, it will be applied to various scenarios to develop a TMDL for eutrophication in the Lower Basin. The goal of the project is to determine the assimilative capacity of the Lower Basin for nutrients, thermal load and other contributors to eutrophication, and to determine means to reduce eutrophication. **Schedule:** Sept. 2002 – Sept. 2004. **Budget:** $200,000 (does not include match of $270,000 already invested or EPA in-kind services). **Prioritization:** Highest. **Watershed Plan Goals Supported:** fishable and swimmable river (long-term). **Milestones** (to determine whether project goals are being met): Model configuration and preliminary calibration, additional data collection, model validation, allocation scenarios and TMDL report, public notice and participation, implementation.

Lower Basin Bacteria Total Maximum Daily Loading. EPA, DEP, and CRWA will develop a bacterial TMDL for the Lower Basin by using existing water quality monitoring data and models and evaluating various best management practices (BMPs) for their likely effectiveness at reducing in-stream bacterial levels. The goal of the project is to determine the assimilative capacity of the Lower Basin to bacteria loads and determine the most effective BMPs for reducing the loads. **Schedule:**

Dec. 2002 – Sept. 2004. **Budget:** $200,000 (includes $80,000 match for monthly water quality monitoring from CRWA). **Prioritization:** Highest. **Watershed Plan Goals Supported:** fishable and swimmable river (long-term). **Milestones:** Model configuration and preliminary calibration, data collection, model validation, allocation scenarios, TMDL report, public participation, implementation.

Upper Charles Total Maximum Daily Loading and Flow Trading. To reduce nutrient and bacteria loads, CRWA is developing TMDLs for the upper Charles River watershed with EPA and DEP. CRWA will investigate the feasibility of using instream river flow as a medium for innovative, multi-media pollution trading. Increased river flow could increase the assimilative capacity of the river to accept pollutants while reducing stormwater loadings through infiltration. Dischargers would have the option of recharging rainwater to increase riverflow, which may be cost-effective compared to TMDL-mandated pollutant removal alternatives. **Schedule:** Ongoing – July 2005. **Budget:** $610,000 (includes $50,000 match from EOEA Watershed Team for nutrient flux and sediment oxygen demand). **Prioritization:** highest. **Watershed Plan Goals Supported:** fishable and swimmable river (long-term) and improved baseflow (long-term). **Milestones:** Public participation, model configuration/preliminary calibration, data collection, model validation, evaluation of flow trading, allocations scenarios, TMDL report.

Fisheries Restoration. The goals of the fisheries project are to better understand the effects of flow and channel modification on the Charles River fish communities, to establish clear restorative objectives for flow protection and augmentation, and to implement a restoration demonstration project. CRWA is assisting MA Division of Fisheries & Wildlife (DFW) with its assessment of current fish communities in the Charles River and in developing a target community for the river, which will lead to the development of flow recommendations to restore and protect fish that can be incorporated into management and permitting decisions. The EOEA Watershed Team will implement a demonstration project to restore and attract the target fish population. **Schedule:** Aug. 2002 to June 2005. **Budget:** $72,470 (includes $26,470 match from CRWA and $46,000 from EOEA Watershed Team).

Prioritization: Moderate. **Watershed Plan Goals Supported:** develop target fish community (short-term), improve fisheries habitat and access (long-term), fishable and swimmable river (long-term). **Milestones:** target fish community development, restorative goals.

SmartStorm™. CRWA has designed an innovative residential cistern-drywell water retention system, SmartStorm™, to capture clean runoff from rooftops and allow homeowners to water their gardens without worry of a watering ban. This system has great potential for reducing stormwater runoff, flooding, combined sewer overflows, and demand on potable water supplies while increasing groundwater recharge and instream flow. CRWA plans to install these systems in the watershed and test their effectiveness in enhancing groundwater recharge and reducing stormwater pollution. **Schedule:** Spring 2003 – Spring 2006. **Budget:** $150,000 (CRWA to fund entire project with matching funds). **Prioritization:** Highest. **Watershed Plan Goals Supported:** increase recharge and prove efficacy of project (short-term) and improve river baseflow (long-term). Possibly reduce polluted discharge (short-term) and fishable and swimmable river (long-term), if applied to CSO areas. **Milestones:** installation of SmartStorm™ systems, estimated number of gallons of water conserved or stormwater retained, estimated volume of rainwater recharged to the ground.

DNA Monitoring of Dry-Weather and Stormwater Discharges. USGS, in cooperation with EPA and DEP, has established a DNA database of E. coli bacteria from humans, domestic animals, and wildlife hosts in the Lower Charles. Using this database, USGS will collect samples from areas of known or suspected fecal contamination to determine the source(s) of the pollution by cross-referencing results with the DNA database. As an innovative and effective diagnostic and enforcement tool, we expect this database will help us to identify and remove even more illicit sources of contamination to the river. **Schedule:** July 2003 – July 2005. **Budget:** $140,000. **Prioritization:** Highest. **Watershed Plan Goals Supported:** reduce polluted discharges and prove efficacy of project (short-term) and fishable and swimmable river (long-term). **Milestones:** identify predominant species contributing bacteria to lower Charles, removal of sewage from stormdrain system.

Recreational Access and Education (Flagging) System. During the high-use summer months, CRWA will collect and analyze water quality samples up to three days per week and notify the public of the river's suitability for boating via color-coded flags. On other days, CRWA will use a statistical model to predict whether bacteria will violate state water quality standards. Results will be posted at boathouses, in the newspaper, and on CRWA's web site and phone hotline. USGS will continue operation of its Watertown rain gage. **Schedule:** May 2003 – Dec. 2004. **Budget:** $60,000 (includes $10,000 likely to be matched by the Boston Water and Sewer Commission). **Prioritization:** Lowest. **Watershed Plan Goals Supported:** public education and use (short-term and long-term), reduce polluted discharges (short-term) and fishable and swimmable river (long-term). **Milestones:** posting of flags based on water quality, notification to communities of "hot spots" detected.

Municipal Stormwater Education and Control. The EOEA Watershed Team will work closely with municipalities in the Charles to implement improvements to their stormwater practices, prepare and adopt stormwater bylaws, maximize opportunities for recharge, implement land use practices protective of river resources, and generate an information network to publicize training and educational opportunities. **Schedule:** July 2003 – July 2005. **Budget:** $200,000 (includes $100,000 match from EOEA Watershed Team). **Prioritization:** Moderate. **Watershed Plan Goals supported:** public education (short-term and long-term), reduce polluted discharges (short-term), increase recharge (short-term), and fishable and swimmable river (long-term). **Milestones:** implementation of high-priority stormwater management projects, passage of bylaws and ordinances, attendance at workshops.

Watershed Action Plans. Project partners will present latest results of studies and demonstration projects to the Clean Charles 2005 Task Force, which meets annually or semi-annually, and the EOEA Charles River Watershed Team, which meets quarterly. CRWA, with project partners, will develop action plans to guide implementation of watershed restoration. Project partners will cover the cost of their participation in meetings. **Schedule:** throughout two-year project. **Budget:** $100,000 (includes $20,000 match, based on attendees' estimated salaries). **Prioritization:** Highest.

Watershed Plan Goals Supported: Development of specific implementation guidelines (short-term), continued coordination of Project Partners (long-term), as well as all other goals. **Milestones:** annual EPA Clean Charles 2005 meetings, quarterly Watershed Team meetings, watershed action plans.

3. Description of Management and Stakeholder Involvement

The Charles River Watershed Association is the lead organization for the Charles River Watershed Plan. Key CRWA staff members are Robert Zimmerman, Jr., Executive Director, and Kathleen Baskin, Project Director. Under Mr. Zimmerman's direction, CRWA began a comprehensive study of the Charles in 1994 and has sought non-traditional solutions to age-old environmental problems including flow trading and the SmartStorm™ Rainwater Recovery System. Mr. Zimmerman will provide general oversight of the watershed plan and its implementation. With over 18 years of experience in water quality and flow, Ms. Baskin has managed, or is managing, nearly all of CRWA's technical projects including IM3, Upper Charles TMDLs, Target Fish Assemblage, and the Flagging System. Ms. Baskin will be responsible for technical quality, budgeting, and scheduling of all projects under the EPA Watershed Initiative Program. Key staff of project partners include Mark Voorhees, EPA's Massachusetts TMDL Coordinator and Lead Water Quality Analyst for the Clean Charles 2005 Initiative, who is responsible for overseeing all EPA activities related to improving water quality in the Charles River Basin and is EPA's Project Manager of the Eutrophication and bacteria TMDLs for the Lower Basin. Dr. Peter Weiskel, Program Officer for the U.S. Geological Survey in Massachusetts and Rhode Island, led the USGS effort to quantify bacteria, nutrient, and metals loads to the Lower Charles River and is collaborating with EPA and DEP in a pilot study to test innovative bacterial source tracking methods (rep-PCR DNA) in a sub-watershed of the Lower Charles. The DNA library developed during this pilot effort will be used in the DNA project proposed for funding. Sara Cohen, EOEA Charles River Watershed Team Leader, has played an active role in coordinating partners' efforts, and will manage the municipal stormwater and land use projects, the habitat restoration demonstration project, and much of the public outreach. The project partners have expertise in water

quality monitoring, computer modeling, GIS, engineering, hydrologic science, biology, environmental policy, and law. Resumes of key personnel are in Appendix G. We intend to hire Tetra Tech and Numeric Modeling for computer modeling of the Lower Basin, and Industrial Economics, Inc. for economic analyses of flow trading and BMPs.

Numerous other stakeholders will play a role in attaining the Charles River watershed plan goals and objectives: over 1,200 volunteers (combined) from CRWA's monthly water quality monitoring program, and annual Earth Day cleanup and Run of the Charles Canoe and Kayak events; local Stream Teams; local departments of public works; businesses; university researchers who provide additional research and expertise; and other non-profit environmental organizations, including the Charles River Conservancy, the Urban Ecology Institute, and the Clean Charles Coalition.

4. Description of Outreach Activities

Over the past several years, the EOEA Watershed Team, EPA, and CRWA have developed strong relationships with other state and federal agencies, municipalities, universities, environmental organizations, and citizen activists. A number of groups will be actively enhancing public understanding of the watershed and encouraging public participation in the watershed plan. The EOEA Watershed Team will host meetings to pass information on to other agencies, citizens, and municipalities. The Clean Charles Coalition, a group of prominent businesses, universities, and institutions along the Charles, is raising the awareness of the Charles and providing stormwater management training to smaller companies. The Charles River Conservancy has recently begun a grass-roots effort to maintain the Metropolitan District Commission's parkland with its Volunteer Maintenance Program. Boston College's Urban Ecology Institute sponsors environmental field curricula in middle and high schools within the Charles River watershed. All of these groups have a wide audience to whom they would bring the results and lessons learned from these projects.

EOEA will develop a 5-Year Action Plan to disseminate findings of all evaluative projects, and translate them into tasks for a broad audience that serves as a model for other watersheds. The EOEA

Watershed Team will support two volunteer citizen Stream Teams involved in habitat restoration projects, local shoreline surveys, cleanups, and education campaigns. EOEA will publicize knowledge gained from this effort to other areas, through its Watershed Initiative, which assigns a Watershed Team and Leader to each of the state's 27 watersheds. Team Leaders meet regularly with each other to discuss projects and to share information, which can then be passed along to the Leaders' respective Watershed Teams. CRWA will transfer project knowledge to other areas through the New England Watershed Management Consortium, a group of 12 watershed associations who meet regularly for technical training and who collaborate on technical projects. We will also work with River Network, a national network of watershed groups, to publicize the findings and results of this project and will feature key aspects of the project at River Network's River Rally, where hundreds of watershed organizations share technical and policy information. The project descriptions and results will be featured in our newsletter, *The Streamer*, which is sent to over 7,000 CRWA members and friends, and is available on our website, www.charlesriver.org. EPA-Region 1 will continue to publicize results to other EPA offices. USGS will prepare a project report for broad circulation to the public and its other regional offices. **Schedule:** June 2003 - July 2005. **Budget:** $44,000 (includes matches of $4,000 from EOEA Watershed Team and $20,000 from CRWA). **Prioritization:** Medium. **Watershed Plan Goals Supported:** public education (short-term and long-term). **Milestones:** Public meetings, newsletter and website articles, active Stream Teams, connecting watershed issues with school curricula.

Together, these projects represent perhaps the most comprehensive assessment of a river in the country. Because the Charles is of a manageable scale, that assessment can be quickly turned into actions that have measurable results.

APPENDIX A

PROPOSAL COVER LETTER FROM GOVERNOR JANE SWIFT

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
STATE HOUSE • BOSTON 02133
(617) 727-3600

JANE SWIFT
GOVERNOR

November 18, 2002

Robert Wayland
Director, Office of Wetlands, Oceans,
and Watersheds
Mail Code 4501T
USEPA
1200 Pennsylvania Avenue NW
Washington, D.C. 20460

Dear Mr. Wayland:

It is my pleasure to nominate the Charles River Watershed Association for funding through the EPA Watershed Initiative to continue the great strides made in recent years.

The EPA showcases the Charles River as one example of an outstanding watershed program, featuring it in President Bush's Watershed Initiative. EPA-Region 1 remains committed to working with the Association and achieving swimmable and fishable waters in the Charles River by Earth Day 2005.

Though watershed management has been a proven success in the Charles River, there is still more work to be done. Led by science, hard work, and community collaboration, the Charles River Watershed Association seeks to implement Total Maximum Daily Loads (TMDLs), improve baseflow, improve fish access and habitat, replenish diminishing water supplies, and improve degraded water quality. Though this may sound ambitious, the Association has proven their ability to face difficult challenges and secure success.

I ask that you give this proposal your careful consideration and nominate the Charles River Watershed Association for funding.

Sincerely,

Jane M. Swift

Enclosure

APPENDIX B

COMMITMENT LETTERS FROM ACTIVE PARTNERS

Charles River Watershed Association

18 November 2002

Robert Wayland, Director
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Letter of Financial Commitment for the Charles River Watershed Plan

Dear Mr. Wayland:

Since its inception in 1965, the Charles River Watershed Association (CRWA) has figured prominently in the environmental arena as an advocate for the protection and preservation of the health, beauty and access of the Charles River and its tributaries. Through CRWA's comprehensive, integrated study of water quality, flow, biota, and land use in the Charles River watershed, which began in 1994, we have identified the most critical problems impairing uses in the river and have addressed some of them with the help of federal and state agencies, municipalities, businesses and institutions and citizens. The most telling piece of evidence of our accomplishments is CRWA's monthly water quality monitoring data. It shows that in 2002 the river is suitable for swimming twice as often as in 1995 (40% versus 20% of the time).

Our ultimate goal is a fishable and swimmable river by 2005. Consequently, much work still needs to be accomplished for the complete restoration of the river. CRWA, along with our project partners, is strongly committed to using staff and financial resources to build upon previous efforts and successes to reach our goal. In fact, some of the projects proposed are underway. CRWA will provide matching funds of $277,000 to the $1.3 million grant being requested from EPA's Watershed Initiative Program for the Charles River Watershed Plan. This match includes $150,000 for SmartStorm™, $80,000 for water quality monitoring, $27,000 for fisheries restoration, and $20,000 for public outreach.

If you have any questions or concerns, please feel free to contact me at (617) 965-5975.

Sincerely,

Robert Zimmerman, Jr.
CRWA Executive Director

2391 Commonwealth Avenue, Auburndale, Massachusetts 02466-1773, Telephone (617) 965-5975 Fax (617) 332-7465
Website: www.crwa.org Email: crwa@crwa.org.

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
251 Causeway Street, Suite 900
Boston, MA 02114-2119

JANE SWIFT
GOVERNOR

BOB DURAND
SECRETARY

Tel. (617) 626-1000
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November 13, 2002

Mr. Robert Wayland, Director
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue NW
Washington, DC 20460

Dear Mr. Wayland,

I am writing to support Governor Jane Swift's nomination of the Charles River Watershed Association's (CRWA) proposal for funding under the Environmental Protection Agency's (EPA) Watershed Initiative. CRWA has an extensive history of achieving measurable improvements in the condition of the Charles River. They are currently at the forefront of designs to raise the standards yet again, achieving further improvements in water quality, base flows, and protective land use practices. The proposal includes support for the completion of three critical TMDL's in the watershed, one of which will pioneer flow trading as a tool to account for groundwater impacts in allocating pollutant loads. The proposal also includes innovative mechanisms to improve the quality and recharge capacity of stormwater, the continued removal of illicit cross-connections to storm drains, and the use of DNA source tracking by species to better target efforts to reduce bacteria loads. In short, the plan described in this proposal reflects the comprehensive treatment of watershed restoration that has become CRWA's signature.

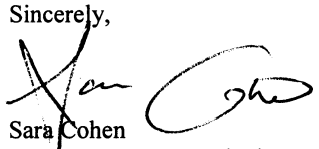
In addition to providing measurable results, CRWA's proposal provides a strong model for partnerships. The projects proposed directly reflect the broad collaborative work in the Charles over the past ten years. They were developed and will be implemented in cooperation with the federal and state regulating agencies, the research community, and the Executive Office of Environmental Affairs' Charles River Watershed Team, which includes representatives from all the above groups in addition to municipal and non-governmental stakeholders. The proposed projects would further all of the highest priority goals set forth by the Charles River Watershed Team and would serve as the backbone for the Team's development of a 5-Year Action Plan to guide and prescribe implementation of the TMDL's, habitat improvement measures, and flow restoration efforts. The Action Plan will additionally serve as an outreach tool to inform and include local constituents in watershed protection efforts, and to assist other watersheds in learning about and replicating the successes of the Charles.

The Executive Office of Environmental Affairs and the members of the Watershed Team are committing our efforts over the next two years to generate a consistent link between CRWA's proposed projects and the municipalities, ensuring local involvement in both the definition of the problems and the implementation of the solutions. Specifically, in the coming two years, the Team intends to develop an extensive municipal information network; prepare tool boxes of environmentally protective ordinances, by-laws, zoning strategies, funding sources, and management practices specific to the Charles communities; organize and support local "Stream Teams" of active volunteer citizens; and provide direct assistance to towns to bring conceptual projects to the implementation stage. By enhancing this link to the local level, the Watershed Team is a full partner to CRWA in this proposal. In additional support, the Team will fund sediment oxygen demand and nutrient flux analyses for CRWA's Upper Basin TMDL, and habitat improvement measures based on the findings of the proposed target fish assemblage project. In this manner, the Team's expected annual $100,000 budget – to support these outreach, research, and restoration efforts – is offered as a direct match for CRWA's proposal, over a two-year duration, for an expected total of $200,000.

While it is certainly the case that EPA's funding should support other watersheds to replicate the successes of the Charles, I hope you will agree that it is equally important to "advance the front line." The additional funding through this program will allow CRWA, the Watershed Team, and the extensive group of partners supporting and embodying the proposal, to synthesize and complete several longstanding projects, demonstrating in a replicable

fashion what a "watershed approach" is able to achieve. Thank you very much for your time, and if I can provide any further information, please don't hesitate to contact me.

Sincerely,



Sara Cohen
Charles River Watershed Team Leader, Massachusetts Watershed Initiative
Executive Office of Environmental Affairs

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Massachusetts-Rhode Island District
10 Bearfoot Road
Northborough, MA 01532
508-490-5026

November 11, 2002

Mr. Robert Wayland
Director
Office of Wetland, Oceans, and Watersheds
Mail Code 4501T
United States Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

Dear Mr. Wayland:

The U.S. Geological Survey is pleased to collaborate with the Charles River Watershed Association in a proposed scientific investigation of fecal-bacteria DNA patterns in water samples from the Lower Charles River Watershed, beginning in the summer of 2003. This investigation, as described in a proposal to the U.S. EPA Watershed Initiative, will advance the basic understanding of bacterial sources in urban watersheds, and will build upon an extensive amount of recent research by the USGS in the watershed.

As the Nation's principal earth-science agency, the USGS mission is to collect data and conduct research on the status of our Nation's natural resources (including water resources), and to interpret and report that information in an impartial and objective manner. The proposed bacteria source-tracking investigation will advance the USGS mission and assist local, state, federal, and non-governmental agencies to better understand and protect those resources.

Subject to the appropriation of funds, the USGS could be in a position to partially match contributions of State or local government agencies to this project in Federal FY 04. If you have any questions, please call me at 508-490-5002.

Thank you very much.

Sincerely,

Wayne H. Sonntag
District Chief

cc: K. Baskin, CRWA
P. Weiskel, USGS

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Metropolitan Boston – Northeast Regional Office

JANE M. SWIFT
Governor

BOB DURAND
Secretary

LAUREN A. LISS
Commissioner

November 20, 2002

Robert Wayland, Director
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Letter of Commitment for the Charles River Watershed Plan

Dear Mr. Wayland,

The Massachusetts Department of Environmental Protection (DEP) strongly supports the Charles River Watershed Plan proposal submitted by the Charles River Watershed Association (CRWA) under the US EPA Watershed Initiative Grant Program. The various projects proposed under this grant program will not only help further the progress of attaining the collective goal of CRWA, EPA, DEP, other federal and state agencies, businesses and public for a swimmable and fishable Charles River by Earth Day 2005 but also complements the main strategy employed by DEP to protect and maintain Charles River water quality, the Watershed Approach. The approach is a 5-year phased holistic program for watershed-based assessment, permitting, outreach and non-point source pollution control that has been adopted by DEP's Bureau of Resource Protection to address its Watershed Management goals. The plan also aligns with our approach because it focuses on building local and regional coalitions to bring about the next major increment of water quality improvements to the river.

DEP's commitment to the river's restoration is long-standing. The agency has provided staff and financial resources to implement previous watershed studies, such as the establishment of a DNA database of e.coli bacteria from humans, domestics animals and wildlife hosts and an assessment

of stormwater management programs in the upper watershed, that now serve as the foundation for two proposed projects, DNA Monitoring of Discharges and Municipal Stormwater Education and Control. In addition, we will work with CRWA and EPA to develop total maximum daily loads for the Upper Charles River watershed to reduce nutrient, chlorophyll a, and bacteria loads.

Over the past decade, major gains have been made in improving the health of the Charles River, which now serves as a model for watersheds throughout the state and nation. Yet the restoration work is not complete. This comprehensive Charles River Watershed Plan is ready to be put into action and should be fully supported to ensure implementation of restoration efforts for further improvement of the river's health and to showcase new initiatives in a successful watershed program.

Sincerely,

Madelyn Morris

Madelyn Morris
Deputy Regional Director
Bureau of Resource Protection.

CLEAN CHARLES COALITION

781.386.0926 WWW.CLEANCHARLES.ORG

November 8, 2002

Robert Wayland, Director
Office of Wetlands, Oceans, and Watersheds
Mail Code 4501T
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: *Letter of Support and Commitment for the Charles River Watershed Plan*

Dear Mr. Wayland,

The Clean Charles Coalition, a voluntary association of industries, academic institutions, research groups and others, strongly supports the Charles River watershed plan and is committed to playing an active role in implementing it with the major project partners, the Charles River Watershed Association, US EPA-New England, United States Geological Survey and the Massachusetts Executive Office of Environmental Affairs. The coalition's mission is to leverage our collective resources to support the attainment of a "fishable and swimmable" Charles River by the year 2005. The coalition has already taken a lead in the public outreach component of the plan. We have established strong relationships with the businesses and institutions located within the watershed to develop and promote an awareness of the importance of the Charles River as a valuable urban resource. We hold monthly meetings to discuss coalition goals, project status, Charles River news and events. We sponsor a college intern to assist us in education and outreach.

Another important initiative is to execute projects that can measurably minimize the contamination of stormwater runoff flowing into the river. We host a website (www.cleancharles.org) that provides on stormwater best management practices for businesses and residents. In 1999, we sponsored a Phase II stormwater management seminar to educate the municipalities and businesses about stormwater management tools and the regulatory requirements.

As 2005 is quickly approaching, we are more than ever committed to focusing public attention on cleaning up the river and enhancing the opportunities for inter-institutional education, training, outreach and cooperation. We strongly urge you to support the Charles River watershed plan.

Sincerely,

Stephen Greene
For the Clean Charles Coalition

TOWN OF BELLINGHAM

OFFICE OF THE
DIRECTOR OF THE DEPARTMENT OF PUBLIC WORKS
26 BLACKSTONE STREET
BELLINGHAM, MA 02019
(508)-966-5813
FAX (508)-966-5814
ddimartino@bellinghamma.org

November 12, 2002

Mr. Robert Wayland, Director
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: **Letter of Support for the Charles River Watershed Plan**

Dear Mr. Wayland:

The Town of Bellingham in Massachusetts strongly supports the Charles River Watershed Plan being proposed by the Charles River Watershed Association (CRWA) for the EPA Watershed Initiative Grant Program.

Bellingham is located along the Interstate 495 Technical Corridor, a rapidly developing business area. The area is facing severe water shortages due to increased water demand and increased impervious surfaces. Over the years, the town has worked closely with the project proponents to protect our precious water resources.

Most recently we worked in conjunction with CRWA to effectively advocate implementation of mitigation measures by American National Power Company for construction of a new power plant in the town. American National Power Company agreed to minimize and mitigate water usage by switching from water-cooled to air-cooled systems in both the Bellingham and Blackstone facilities. They also agreed to fund: water system leak repairs, water awareness education and outreach, stormwater related quality and aquifer recharge improvement projects, and retrofitting of municipal buildings with water saving devices.

Currently, we are cooperating with CRWA on the Upper Charles groundwater modeling project, an assessment of stormwater management programs in the upper watershed, and a SmartStorm™ pilot project. The other projects they are proposing in the Watershed Plan would help further our goals of sustaining water resources for our residents, the river, fisheries, and wildlife.

The Town of Bellingham is a major stakeholder in the Charles River watershed, we have successfully collaborated with these organizations in the past and we encourage you to award the project proponents an EPA Watershed Initiative Grant to keep these efforts going strong.

Sincerely,

Donald F. DiMartino
DPW Director

cc: Robert Zimmerman, CRWA
Sara Cohen, DEP Charles River Basin Team Leader

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

November 12, 2002

Robert Wayland, Director
Office of Wetlands, Oceans, and Watersheds
Mail Code 4501T
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: Letter of Commitment for the Charles River Watershed Plan

Dear Mr. Wayland:

Over the past few years, the Boston Water and Sewer Commission (BWSC) has supported the Charles River Basin Water Quality and Public Notification (Flagging) Program with a yearly grant award and by providing rainfall data for developing statistical correlations with bacteria data. Through color-coded flags, this program signals to the river and parkland users on a daily basis the water quality of the river from Watertown Dam to Longfellow Bridge in Boston, where upwards of 20,000 people visit the river. In addition, the extensive database from this program has tracked the temporal and spatial trends of bacterial concentrations in the Basin. It educates the public that water quality conditions on the river have improved over the years and are most impaired one to several days after a rainstorm. We hope to continue our support for the Flagging Program in the Charles River Basin in 2003.

Besides funding the Flagging Program, BWSC has worked to improve the health of the river and reduce flooding by eliminating illicit connections to the sewer system, repairing failing infrastructure and educating the public about stormwater pollution and management. The cleanup of the Charles River is a long-term collaborative effort between various agencies and organizations that are committed to helping achieve a fishable and swimmable Charles River by 2005. We strongly urge you to support the Charles River Watershed Plan under the EPA Watershed Initiative Grant Program.

Sincerely,

Vincent G. Mannering
Executive Director

THE WORKS
CAMBRIDGE DEPARTMENT OF PUBLIC

Lisa Peterson
Commissioner

147 Hampshire Street
Cambridge, MA 02139
617-349-4800
TTD 617-349-4805

12 November 2002

Robert Wayland, Director
Office of Wetlands, Oceans, and Watersheds
Mail Code 4501T
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Letter of Support for the Charles River Watershed Plan

Dear Mr. Wayland,

The City of Cambridge Department of Public Works (DPW) supports the watershed plan for the Charles River in Eastern Massachusetts. The city situated on the banks of the Charles has benefited tremendously from this central water resource that has afforded our residents a slice of greenspace and a myriad of recreational opportunities in our heavily urbanized community.

The river also serves as the receiving water for most of the city's stormwater runoff. During wet weather events, the water quality of the river has declined due to combined sewer overflows and runoff of pollutants from waterfowl feces, trash, oil, grease, fertilizers and pesticides. Flooding also occurs, especially after heavy rainstorms. The Cambridge DPW's diligent work in identifying and removing illicit connections to storm sewer pipes, repairing failing infrastructure and minimizing combined sewer overflows to the river has been very effective in mitigating point source pollution and improving the health of the river. We are now focusing our attention on non-point stormwater pollution and flooding. With the guidance of the federal and state regulators and other watershed groups, we are implementing non-structural and structural best management practices and educating our residents on stormwater management. In addition, we are particularly interested in the SmartStorm™ Rainwater Recovery System and its potential for reducing potable

water use for residential irrigation needs and promoting infiltration, by temporarily holding roof runoff in cisterns for residential irrigation or recharge into the ground.

Over the past five years, major gains have been made in improving the health of the river and we are committed to continuing our work with our partners for further improvements. Yet we also need your support to build off these achievements and meet our goal of a fishable and swimmable Charles River by 2005.

Sincerely,

Owen O'Riordan
Assistant Commissioner for Engineering and
City Engineer

TOWN OF FRANKLIN

DEPARTMENT OF PUBLIC WORKS

Franklin Municipal Building
150 Emmons Street
Franklin, MA 02038-2095

8 November 2002

Robert Wayland, Director
Office of Wetlands, Oceans, and Watersheds
Mail Code 4501T
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Letter of Support for the Charles River Watershed Plan

Dear Mr. Wayland,

The Town of Franklin in Massachusetts strongly supports the Charles River watershed plan being proposed by the Charles River Watershed Association (CRWA), US EPA-New England, the United States Geological Survey (USGS), and the Massachusetts Executive Office of Environmental Affairs.

Franklin, one of the fastest growing communities in Massachusetts, is facing severe water shortages due to increased water demand and increased impervious surfaces that decrease infiltration of rainwater into the ground. Over the years, we have worked closely with the project proponents to address our water resource problems. Most recently we have shared information with CRWA and the State regarding the town's stormwater management practices for their assessment and for them to make recommendations on the town's stormwater management program. We hope that project goes a step further to provide stormwater education, outreach, and control in the upper watershed with an EPA Watershed Initiative grant. Also we would strongly benefit from the work of the Upper Charles River TMDL, Flow Trading and SmartStorm™ projects, which would improve the water quality of the river and increase recharge to our groundwater resources.

As a major stakeholder in the Charles River watershed, we have successfully collaborated with these organizations in the past and will continue to do so to keep our waters clean and viable. We encourage you to look favorably upon this proposal and award the project proponents an EPA Watershed Initiative Grant.

Sincerely,

William A. Fitzgerald, Jr.
DPW Director

Phone: (508) 520-4910 • Fax: (508) 520-4939 • E-mail: DPW@franklin.ma.us

APPENDIX C

LETTERS COMMITTING MATCHING FUNDS

Charles River Watershed Association

18 November 2002

Robert Wayland, Director
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Letter of Financial Commitment for the Charles River Watershed Plan

Dear Mr. Wayland:

Since its inception in 1965, the Charles River Watershed Association (CRWA) has figured prominently in the environmental arena as an advocate for the protection and preservation of the health, beauty and access of the Charles River and its tributaries. Through CRWA's comprehensive, integrated study of water quality, flow, biota, and land use in the Charles River watershed, which began in 1994, we have identified the most critical problems impairing uses in the river and have addressed some of them with the help of federal and state agencies, municipalities, businesses and institutions and citizens. The most telling piece of evidence of our accomplishments is CRWA's monthly water quality monitoring data. It shows that in 2002 the river is suitable for swimming twice as often as in 1995 (40% versus 20% of the time).

Our ultimate goal is a fishable and swimmable river by 2005. Consequently, much work still needs to be accomplished for the complete restoration of the river. CRWA, along with our project partners, is strongly committed to using staff and financial resources to build upon previous efforts and successes to reach our goal. In fact, some of the projects proposed are underway. CRWA will provide matching funds of $277,000 to the $1.3 million grant being requested from EPA's Watershed Initiative Program for the Charles River Watershed Plan. This match includes $150,000 for SmartStorm™, $80,000 for water quality monitoring, $27,000 for fisheries restoration, and $20,000 for public outreach.

If you have any questions or concerns, please feel free to contact me at (617) 965-5975.

Sincerely,

Robert Zimmerman, Jr.
CRWA Executive Director

2391 Commonwealth Avenue, Auburndale, Massachusetts 02466-1773, Telephone (617) 965-5975 Fax (617) 332-7465
Website: www.crwa.org Email: crwa@crwa.org.

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
251 Causeway Street, Suite 900
Boston, MA 02114-2119

JANE SWIFT
GOVERNOR

BOB DURAND
SECRETARY

Tel. (617) 626-1000
Fax (617) 626-1181
http://www.magnet.state.ma.us/envir

November 13, 2002

Mr. Robert Wayland, Director
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds
1200 Pennsylvania Avenue NW
Washington, DC 20460

Dear Mr. Wayland,

I am writing to support Governor Jane Swift's nomination of the Charles River Watershed Association's (CRWA) proposal for funding under the Environmental Protection Agency's (EPA) Watershed Initiative. CRWA has an extensive history of achieving measurable improvements in the condition of the Charles River. They are currently at the forefront of designs to raise the standards yet again, achieving further improvements in water quality, base flows, and protective land use practices. The proposal includes support for the completion of three critical TMDL's in the watershed, one of which will pioneer flow trading as a tool to account for groundwater impacts in allocating pollutant loads. The proposal also includes innovative mechanisms to improve the quality and recharge capacity of stormwater, the continued removal of illicit cross-connections to storm drains, and the use of DNA source tracking by species to better target efforts to reduce bacteria loads. In short, the plan described in this proposal reflects the comprehensive treatment of watershed restoration that has become CRWA's signature.

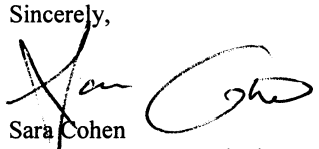
In addition to providing measurable results, CRWA's proposal provides a strong model for partnerships. The projects proposed directly reflect the broad collaborative work in the Charles over the past ten years. They were developed and will be implemented in cooperation with the federal and state regulating agencies, the research community, and the Executive Office of Environmental Affairs' Charles River Watershed Team, which includes representatives from all the above groups in addition to municipal and non-governmental stakeholders. The proposed projects would further all of the highest priority goals set forth by the Charles River Watershed Team and would serve as the backbone for the Team's development of a 5-Year Action Plan to guide and prescribe implementation of the TMDL's, habitat improvement measures, and flow restoration efforts. The Action Plan will additionally serve as an outreach tool to inform and include local constituents in watershed protection efforts, and to assist other watersheds in learning about and replicating the successes of the Charles.

The Executive Office of Environmental Affairs and the members of the Watershed Team are committing our efforts over the next two years to generate a consistent link between CRWA's proposed projects and the municipalities, ensuring local involvement in both the definition of the problems and the implementation of the solutions. Specifically, in the coming two years, the Team intends to develop an extensive municipal information network; prepare tool boxes of environmentally protective ordinances, by-laws, zoning strategies, funding sources, and management practices specific to the Charles communities; organize and support local "Stream Teams" of active volunteer citizens; and provide direct assistance to towns to bring conceptual projects to the implementation stage. By enhancing this link to the local level, the Watershed Team is a full partner to CRWA in this proposal. In additional support, the Team will fund sediment oxygen demand and nutrient flux analyses for CRWA's Upper Basin TMDL, and habitat improvement measures based on the findings of the proposed target fish assemblage project. In this manner, the Team's expected annual $100,000 budget – to support these outreach, research, and restoration efforts – is offered as a direct match for CRWA's proposal, over a two-year duration, for an expected total of $200,000.

While it is certainly the case that EPA's funding should support other watersheds to replicate the successes of the Charles, I hope you will agree that it is equally important to "advance the front line." The additional funding through this program will allow CRWA, the Watershed Team, and the extensive group of partners supporting and embodying the proposal, to synthesize and complete several longstanding projects, demonstrating in a replicable

fashion what a "watershed approach" is able to achieve. Thank you very much for your time, and if I can provide any further information, please don't hesitate to contact me.

Sincerely,



Sara Cohen
Charles River Watershed Team Leader, Massachusetts Watershed Initiative
Executive Office of Environmental Affairs

Boston Water and Sewer Commission

980 Harrison Avenue
Boston, MA 02119-2540
617-989-7000

November 12, 2002

Robert Wayland, Director
Office of Wetlands, Oceans, and Watersheds
Mail Code 4501T
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: Letter of Commitment for the Charles River Watershed Plan

Dear Mr. Wayland:

Over the past few years, the Boston Water and Sewer Commission (BWSC) has supported the Charles River Basin Water Quality and Public Notification (Flagging) Program with a yearly grant award and by providing rainfall data for developing statistical correlations with bacteria data. Through color-coded flags, this program signals to the river and parkland users on a daily basis the water quality of the river from Watertown Dam to Longfellow Bridge in Boston, where upwards of 20,000 people visit the river. In addition, the extensive database from this program has tracked the temporal and spatial trends of bacterial concentrations in the Basin. It educates the public that water quality conditions on the river have improved over the years and are most impaired one to several days after a rainstorm. We hope to continue our support for the Flagging Program in the Charles River Basin in 2003.

Besides funding the Flagging Program, BWSC has worked to improve the health of the river and reduce flooding by eliminating illicit connections to the sewer system, repairing failing infrastructure and educating the public about stormwater pollution and management. The cleanup of the Charles River is a long-term collaborative effort between various agencies and organizations that are committed to helping achieve a fishable and swimmable Charles River by 2005. We strongly urge you to support the Charles River Watershed Plan under the EPA Watershed Initiative Grant Program.

Sincerely,

Vincent G. Mannering
Executive Director

APPENDIX D

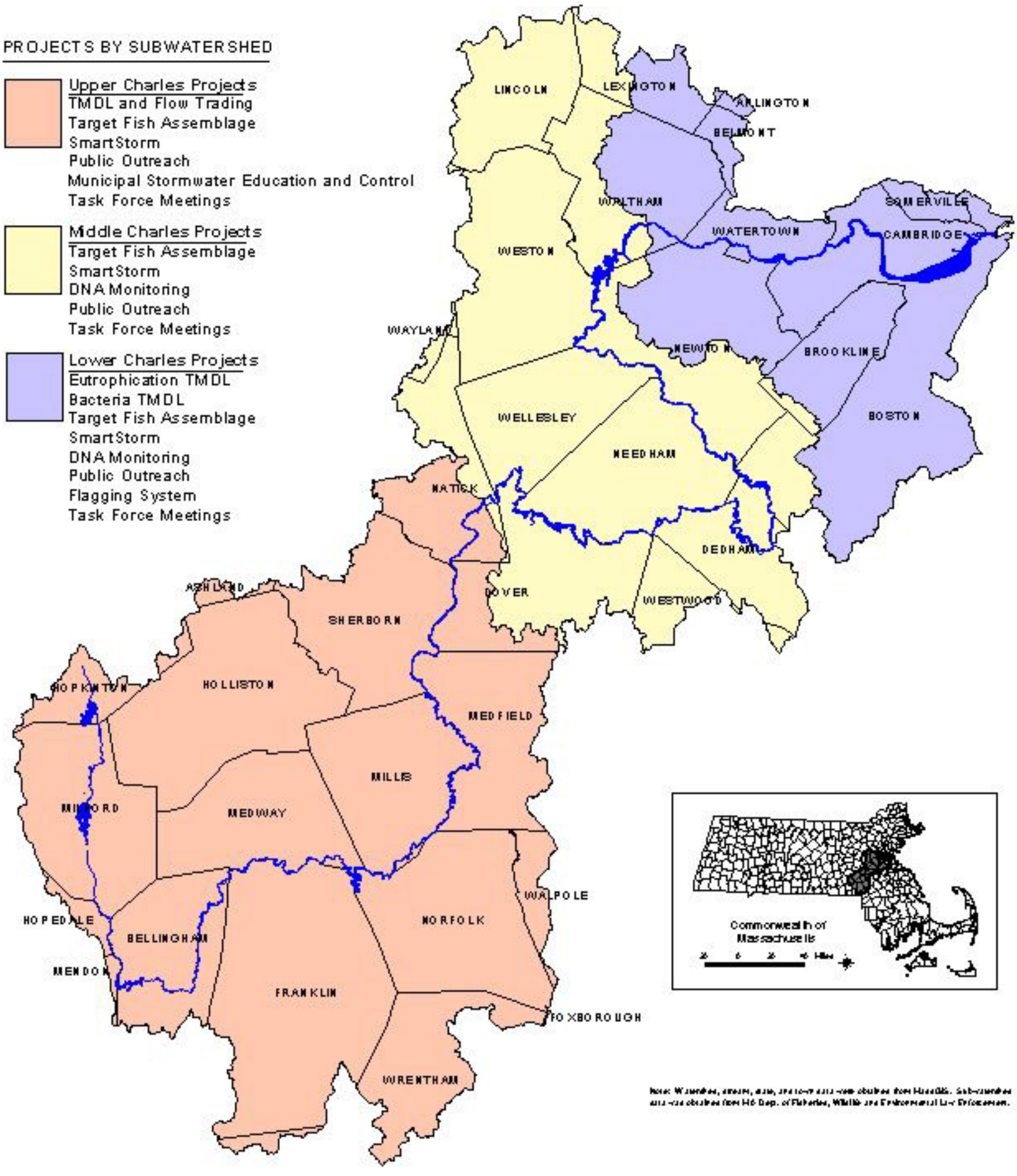
MAP OF WATERSHED AND GENERAL PROJECT LOCATIONS

PROJECTS BY SUBWATERSHED

Upper Charles Projects
TMDL and Flow Trading
Target Fish Assemblage
SmartStorm
Public Outreach
Municipal Stormwater Education and Control
Task Force Meetings

Middle Charles Projects
Target Fish Assemblage
SmartStorm
DNA Monitoring
Public Outreach
Task Force Meetings

Lower Charles Projects
Eutrophication TMDL
Bacteria TMDL
Target Fish Assemblage
SmartStorm
DNA Monitoring
Public Outreach
Flagging System
Task Force Meetings



Note: Watersheds, streams, data, and town outlines from MassGIS. Subwatersheds and river obstacles from MA Dep. of Fisheries, Wildlife and Environmental Law Enforcement.

CHARLES RIVER WATERSHED AND PROJECT LOCATIONS

APPENDIX E

ITEMIZED PROJECT BUDGETS

Budget for the Charles River Watershed Plan
EPA Watershed Initiative Grant Application

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8	Project 9	Project 10	Project/ Contract Management	Total
	Lower Basin Eutrophi-cation TDML	Lower Basin Bacteria TMDL	Upper Charles TMDL and Flow Trading	Fisheries Restoration	SmartStorm	DNA Monitoring	Flagging System	Municipal Stormwater Education	Watershed Action Plans	Public Outreach		
a. Personnel	$40,000	$75,000	$270,000	$14,540	$25,000	$0	$20,000	$0	$55,000	$11,364	$17,045	$527,949
b. Fringe Benefits	$4,000	$7,500	$27,000	$1,455	$2,500	$0	$2,000	$0	$5,500	$1,136	$1,705	$52,796
c. Travel	$500	$1,500	$1,500	$350	$2,188	$0	$1,375	$0	$1,000	$0	$0	$8,413
d. Equipment	$5,000	$1,500	$12,000	$0	$3,000	$0	$1,000	$0	$0	$0	$0	$22,500
e. Supplies	$0	$1,000	$1,000	$0	$42,000	$0	$2,000	$0	$0	$0	$0	$46,000
f. Contractual	$120,000	$60,000	$90,000	$46,000	$0	$140,000	$13,000	$200,000	$0	$24,000	$0	$693,000
g. Construction	$0	$0	$0	$0	$21,000	$0	$0	$0	$0	$0	$0	$21,000
h. Other [(1)]	$500	$1,000	$1,000	$200	$2,000	$0	$3,000	$0	$1,000	$0	$0	$8,700
i. Total Direct Charges (sum of a.-h.)	$170,000	$147,500	$402,500	$62,545	$97,688	$140,000	$42,375	$200,000	$62,500	$36,500	$18,750	$1,380,358
j. Indirect Charges	$30,000	$52,500	$207,500	$9,925	$52,312	$0	$17,625	$0	$37,500	$7,500	$11,250	$426,112
PROJECT TOTALS (sum of i.-j.)	$200,000	$200,000	$610,000	$72,470	$150,000	$140,000	$60,000	$200,000	$100,000	$44,000	$30,000	$1,806,470
MATCHING FUNDS	$0	$80,000 (CRWA)	$50,000 (EOEA Watershed Team)	$72,470 (CRWA, $26,470; EOEA Watershed Team, $46,000)	$150,000 (CRWA)	$0	$10,000 (Boston Water and Sewer)	$100,000 (EOEA Watershed Team)	$20,000 [(2)]	$24,000 (CRWA, $20,000; EOEA Watershed Team, $4,000)	$0	$506,470
REQUEST FROM EPA	$200,000	$120,000	$560,000	$0	$0	$140,000	$50,000	$100,000	$80,000	$20,000	$30,000	$1,300,000

[(1)] Other includes laboratory (DNA Monitoring), printing, copying and graphic design costs.

[(2)] Estimated total salary of Clean Charles 2005 Task Force and EOEA Charles River Watershed Team members for attendance at these respective organizational meetings

APPENDIX F

EVALUATION CRITERIA

EVALUATION CRITERIA

The Charles River watershed proposal should be considered a top candidate for funding. First, President Bush's Watershed Initiative was designed to replicate the huge successes of the Charles in other watersheds across the country. Second, the Charles River restoration is not complete. We must finish the job. We don't want to be a shining example of how to almost reach a watershed restoration goal. Third, many government agencies, municipalities, businesses, environmental organizations, and citizens are poised to help reach that goal.

1. Focus on Results (20 total points).

(a) Watershed plan feasibility and readiness to proceed (10 points). This plan is highly feasible from both technical and political viewpoints. After working together for seven years on the goal of a swimmable and fishable Charles River by 2005, the project partners have a strong understanding of the Charles River system and the work that needs to proceed. All project partners are ready to begin work on this project. In fact, several organizations have already written scopes of work or otherwise laid the groundwork for this next stage in the Charles River restoration. Many of these projects are underway. We expect measurable, replicable results within two years.

(b) Demonstrated ability (5 points). Project participants have demonstrated their abilities at achieving results for the past seven years. CRWA, in particular, the project leader, has demonstrated its ability to take charge and lead large, complicated, and politically-charged projects in the past, starting with the Integrated Monitoring, Modeling, and Management (IM3) Project, which was the catalyst of the entire EPA Clean Charles 2005 effort. Since the IM3 Project, CRWA has repeatedly shown its ability to innovate, communicate, and demonstrate ways to improve conditions in the Charles.

(c) Accountability (5 points). This project will be assessed using measurable results such as: the number of gallons of stormwater removed from a system or treated, the number of gallons of untreated sewage removed, the number of gallons of reduction in potable water demand, and the applicability of innovative demonstration projects to other regions of the country.

2. Broad Support (10 points). This project is consistent with the EPA's goal of a fishable and swimmable Charles River by 2005. Support for the clean up of the Charles starts from the grass-roots level and works up to the highest level of EPA. CRWA's 5,500 members care deeply about the health of the river. Each month, 80 of these members rise at 5:30 a.m. to collect water quality samples along the entire 80-mile long river. Other volunteers, representing geographically focused regions of the watershed, are restoring riverbanks, conducting fish counts, and developing trail systems. Over 1,200 volunteers participated in the Charles River cleanup this year. CRWA has galvanized the public's interest and offered several important research projects supporting the goal of a cleaner Charles. Municipalities and businesses throughout the watershed are working hard to help meet the goal of a cleaner river. Several Massachusetts agencies, including EOEA's Charles River Basin Team, DEP, DFW, MWRA, Department of Environmental Management, Massachusetts Environmental Trust, and the Metropolitan District Commission have spent considerable resources toward achieving this goal. Federal agencies including EPA and USGS have contributed years of valuable research and enforcement to the effort.

3. Innovation (5 points). Several aspects of this project are highly innovative and have not been applied elsewhere in the country. For example, USGS's DNA Source Tracking Project, involving a

library of E. coli specimens from various species will be used to identify the sources of fecal contamination in the river. CRWA's SmartStorm system, a large cistern and infiltration system, will be used to promote stormwater management at the residential level. Flow Trading, or allowing for increased pollutant discharges with increased river flows, has not been explored elsewhere in the country. We are enthusiastic about these demonstration projects and anticipate transferring these projects to other regions of the country.

4. Compatibility with other Federal or State Programs (5 points). This project meets the goals, and has the support, of both EPA's Clean Charles 2005 Task Force and EOEA's Charles River Basin Team. Projects submitted under this proposal were designed in consultation with both groups and are expected to directly benefit the groups' collaborative initiatives and projects.

APPENDIX G

RESUMES

Robert L. Zimmerman, Jr.

Charles River Watershed Association
2391 Commonwealth Avenue
Auburndale, Massachusetts 02466-1773

EDUCATION

MA, English, (1980), BA, English and History, (1976), Central Michigan University**.**

Graduate and Continuing Studies, Finance, Computers, Management, University of Vermont, SUNY Plattsburgh, (1981-85).

EXPERIENCE

Executive Director: (1990 to Present) Charles River Watershed Association**.**

Chief Executive of a private non-profit environmental advocacy, conservation and education group charged with protecting the health, beauty and accessibility of the Charles River and its watershed. Since 1991, organization has grown ten-fold to become the largest watershed association in the nation, measured by annual operating budget and membership. Milestones include:

- Precedent-setting land use victory in parkland disposition for development of new university boat house.
- First non-profit organization in US developing "Total Maximum Daily Load" analyses for ratification by US EPA.
- Development of "environmental zoning" pilot project, prioritizing open space on the basis of environmental function, assessing environmental function and hydrology to develop environmentally-sensitive master-plans, and apply state and federal water regulation to control land use. Work is being adapted as element of statewide sprawl control and affordable housing executive order.
- Comprehensive non-governmental analysis of the Charles River watershed to establish pollutant loadings, groundwater hydrology and stormwater impacts in a linked system. Lead a multi-institutional effort, including CRWA, the Massachusetts Institute of Technology, Tufts University, UMass-Amherst, Boston University, Tellus Institute, EPA-New England, the Massachusetts Water Resources Authority (MWRA), and the Massachusetts Department of Environmental Protection (DEP).
- Developed the technical capacity of CRWA to include a complete water analysis laboratory, and computer geographic mapping and computer modeling labs, staff expertise in chemistry, environmental, civil and agricultural engineering, hydrology, biology, biochemistry, and environmental science.
- With EPA and DEP, have spearheaded change to regulations affecting the state revolving fund, stormwater management, new source approval for public water supply, and wastewater treatment and discharge.

- Negotiated with energy producers to reduce cooling water demands 40-fold, and enhance regional environmental resources and habitat.

Founder, Headmaster: (1978 to 1990) National Sports Academy.

Chief Executive of a preparatory school offering a complete secondary curriculum and world-class training program for alpine and Nordic skiers, ski jumpers, lugers, hockey players, and speed and figure skaters. Founded the school. Developed preparatory curriculum, marketing strategy and materials, managed facilities and information systems, successfully lobbied state and federal government for recognition and funding, formed subchapter S and not-for-profit corporations.

PROFESSIONAL APPOINTMENTS

Massachusetts Water Resources Commission, Commissioner (1991-present)
MIT Sea Grant College Program, State and Industry Advisory Committee (1991-present)
Earth Share Board of Directors (1992-present)
Earth Share Board President (1996-present)
Massachusetts Watershed Coalition Board of Directors (1992-1995)
MWRA Toxics Reduction and Control Advisory Committee (1992-1993)

RECENT PUBLICATIONS

Integrated Watershed Permitting: Testing New Permitting Tools in the Charles River Watershed. Proceedings of the Air & Water Management Association Environmental Permitting Conference. In press.

Medfield, MA Open Space Project: Prioritizing Open Spaces, Sustaining Natural Resources. (with G. Barden, C. Hilberg, K. Bowditch) Submitted to the Town of Medfield, MA, June, 1998.

Watershed Assessment in the Charles River Basin. (with A. Gottlieb, M. Domenica) Paper presented at the Water Environment Federation Conference, Denver, May, 1998.

Old Problems Present New Opportunities. Charles River Watershed Association Streamer, Vol. 29, No.2, Spring, 1998.

Goodbye to Tea in Boston. Water, Environment and Technology. February 2002.

Kathleen M. Baskin

Charles River Watershed Association
2391 Commonwealth Avenue
Auburndale, Massachusetts 02466-1773

EDUCATION

MS, Environmental Engineering, Tufts University (1992)

BSCE, Civil Engineering, Tufts University (1984)

BS, Biology, Tufts University (1984)

EXPERIENCE

Project Director: (October 1995 through present) Charles River Watershed Association.

Directing all technical projects including the Integrated Monitoring, Modeling, and Management (IM3) Project for non-profit watershed association.

Management. Manage technical quality, budgets and schedules of work conducted by CRWA staff and university researchers. Coordinate over 80 volunteers for water quality sampling and shoreline surveys. Coordinate with and report to funding organizations – U.S. Environmental Protection Agency, Massachusetts Water Resources Authority, Boston Water and Sewer Commission, and Massachusetts Department of Environmental Protection. Prepare proposals for project funding.

Technical. Monitor flow, water and sediment quality, habitat and biota; model hydrologic and water quality conditions in the watershed; and develop and implement a watershed management plan with strategies for improving conditions in the river to direct water resources policy, regulatory decisions, and water resources management activities in the watershed. Technical disciplines include computer modeling, GIS, water and sediment quality monitoring, flow monitoring, biological assessments, lake and vegetation surveys, sanitary surveys, and preparation of resource assessment reports.

Advocacy and Education. Perform advocacy on behalf of the Charles River based on results of IM3 sampling and surveys. Review local, state and federal policies and plans that may affect the river. Serve on EPA's Task Force 2005, organized to achieve the goal of a fishable and swimmable Charles River by Earth Day 2005, MWRA Infiltration and Inflow Task Force, MassDEP Stormwater Advisory Committee, MassDEP NPDES Advisory Committee, MassDEP Charles River Basin Team. Also serve on Minuteman Science-Technology High School Environmental Technology Program Advisory Board Meeting. Perform public outreach to watershed communities and businesses.

Project Engineer II: (1984 through October 1995) Metcalf & Eddy, Inc.

Coordinated multi-disciplinary projects. Scheduled and staffed projects. Prepared reports and designs and managed databases. Provided technical review and quality assurance. Developed and maintained budgets. Communicated directly with clients. Supervised technical and support staff. Selected and managed subcontractors. Presented to clients, public, and peer organizations. Conducted business development through writing proposals and letters of introduction, attending pre-bid meetings, and participating in interviews.

Project experience related to water quality, stormwater, hazardous waste, wastewater, groundwater and soils, water supply, residuals management, and combined sewer overflows. Skills include analysis and modeling of water quality impacts associated with point and non-point source discharges; environmental impact analyses associated with siting large, controversial facilities; investigation and development of remediation strategies for contaminated surface water, groundwater and soils; and wastewater residuals management.

PROJECT EXAMPLES

- Directing Low Flow and Habitat Assessment in the Upper Charles River Watershed Project, funded in 2001 by MET. The goals of the project are to develop in-house technical capability to conduct habitat assessments; develop baseline data of habitat conditions; increase public awareness of low flow issues and the effects on habitat; and support flow and habitat research of USGS. In the fall of 2000, CRWA staff received formal training from USGS in habitat assessment following the procedures outlined in EPA's Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers.

- Directing CRWA's Water Quality Monitoring and Public Notification Project, funded in 1998 and 1999 by EPA's EMPACT program. This project involves the daily collection of water quality samples at four locations. The data are analyzed and an interpretation of results (i.e. "safe" or "not safe" for boating) is presented using color-coded flags, WBZ TV4 News, a hotline and CRWA's web site.

- Managing development of TMDLs in the upper Charles River watershed for nutrients, dissolved oxygen and bacteria. Developing scope of work for extensive wet and dry weather fieldwork, overseeing computer modeling and public outreach program.

- Directing CRWA's Integrated Monitoring, Modeling and Management Project, a multi-year project to identify and correct environmental problems in the watershed. The project includes the management of 90 volunteers who have collected monthly water quality samples since 1996. Developed CRWA's Water Quality Monitoring Manual and prepared the Quality Assurance Project Plan; electronic versions of both documents have been shared with other volunteer monitoring organizations. The data generated on this project has been used extensively by others including: DEP, who reported CRWA's data in its Baseline Assessment report; EPA, who has used the data in enforcement cases against illegal dischargers and as the basis of its annual "grade" of the overall condition of the Charles; citizens; businesses; and educators.

MEMBERSHIPS

Water Environment Federation
New England Water Environment Association
American Society of Civil Engineers

REGISTERED PROFESSIONAL ENGINEER – Massachusetts and Maine

Anna L. Eleria

Charles River Watershed Association
2391 Commonwealth Avenue
Auburndale, Massachusetts 02466-1773

EDUCATION

MS, Water Resources Engineering, Tufts University, Medford, MA (2000 - 2002)
Thesis: Forecasting Fecal Coliform Bacteria Concentrations in the Charles River Basin

BS, Natural Resources and Environmental Sciences, Univ. of Minnesota (1992 -1996)
Area of Concentration: Water Resources

RELATED COURSEWORK

Fluid Mechanics	Hydrology	Water Resources Engineering
Groundwater Hydrology	Water Resources Policy	Environmental Statistics

EXPERIENCE

Project Engineer/Environmental Scientist, Charles River Watershed Association.
Sept. 1996 - Feb 1997, April 1998 through present

Manage and conduct research on watershed projects that involve issues in water quality, water quantity, stormwater assessment, groundwater resources, and ecology. Involved in various aspects of projects including staffing, budgeting, field work, data analysis, research, design of water quality monitoring procedures, creation of quality assurance project plans, and report writing.

Project Examples

- Project Engineer on Low Flow and Habitat Assessment in the Upper Charles River Watershed Project. Manage and coordinate project tasks including flow, water level, and water quality monitoring, habitat assessments at riffle sites, and assisting USGS in fish studies and hydraulic modeling. Received formal training from USGS in habitat assessment following procedures outlined in EPA's Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers. Assisted USGS in measuring hydraulic characteristics of riffle sites.

- Lead scientist on the project to assess the effectiveness of best management practices on stormwater quality at three commercial sites. Designed and prepared stormwater sampling procedures and quality assurance project plan. Conducted stormwater sampling. Analyzed water quality data and wrote final report that included a survey of town officials' experiences with the state stormwater policy handbook, a cost-benefit analysis of stormwater management, and modeling of stormwater control.

- Project Engineer in the Boston University Stormwater Remediation Study. The goal of this project was to design the most effective and practicable stormwater control measures on the University campus and assess their effectiveness. Prepared scope of work, quality assurance project plan, and sampling procedures for baseline monitoring and post-construction of BMPs monitoring. Managed and coordinated staffing and sample delivery to laboratories during storm monitoring events. Analyzed data and wrote various reports following monitoring events.

- Key player in the Charles River Flagging Project, a daily water quality monitoring and public notification program since 1998. Trained and managed interns on field work and sample delivery. Posted up-to-date water quality information on website and notified volunteers at boathouses the information to post at their facilities. Analyzed water quality data including a statistical analysis of the relationship between rainfall and bacteria concentrations. Wrote the final reports. Presented our program in various venues including the National EPA EMPACT Conference in 2000 and a television documentary to be aired the fall of 2002.

- Founder and organizer of the Charles River Earth Day Clean Up. The annual event held every April involves more than 1,000 residents of the watershed who pick up trash in the river and along its banks at 20 sites that cover over 60 river miles. Facilitate the steering committee meetings and coordinate the event tasks and roles of committee members. Acquire funds, supplies, and donations for the event.

Environmental Extension Agent, Peace Corps
(March 1997 through December 1997)

Coordinated efforts of volunteers and Senegalese to create a small health clinic. Taught English to high school students. Conducted seminars on composting, gardening, and tree nurseries. Organized a village women's group. Coordinated superintendent and teachers' efforts to implement environmental education into curriculum. Facilitated the creation of environmental lessons plans. Taught classes on personal hygiene, conservation, and the environment. Communicated to Senegalese in French and Wolof, one of several ethnic languages. Adapted to Senegalese culture and norms.

PUBLICATIONS

Roberts, M.L. and Eleria, A.L.. *CRWA's Web Site: Getting the Word Out*. On-line paper submitted to the American Water Resources Association at the Symposium on Water Resources and the World Wide Web. December, 1999.

SKILLS

Computer: Microsoft Programs including Word, Excel, Power Point, Access, and Front Page, Minitab, MathCAD
Language: French

Nigel B. Pickering

Charles River Watershed Association
2391 Commonwealth Avenue
Auburndale, Massachusetts 02466-1773

PROFESSIONAL EXPERTISE

Watershed Modeling	Stormwater Modeling and BMP Assessment
Crop Growth Modeling	Irrigation, Drainage, and Water Management
Surface Water Hydrology	Shallow Groundwater Hydrology
Decision Support Systems	Environmental Chamber Control

TECHNICAL EXPERTISE

Computers (DOS, OS/2, Unix, Win95/NT)	Programming (C, Fortran, Pascal, VB)
GIS (Arcview, Spatial Analyst, Avenue)	SCADA Prog. (Campbell, Keithley, Intellution)
Irrigation System Design and Installation	Water Quality Site Installation and Monitoring
Dairy Design and Permitting	Proposal and Report Writing

EDUCATION

Professional Engineering Exam (PE), State of Florida (4/97).
PhD Agric. Engineering, Cornell Univ., Ithaca, NY (1/90). Chairman: Tammo Steenhuis.
MS Agric. Engineering, Cornell Univ. (5/82). Chairman: Douglas Haith.
BS Agric. Engineering, Univ. of Natal, South Africa (12/77). Advisor: Potgieter Meiring.

EXPERIENCE

Senior Engineer (Feb 2000 - present). Charles River Watershed Association, Newton, Massachusetts.

Developing an HSPF surface water quality model for the upper Charles River watershed that will be used to estimate loads for a nutrient TMDL. Worked with USGS to develope a MODFLOW groundwater model in the upper Charles River watershed. Developed the recharge map for USGS using HSPF. Developed scope of work for GIS-based environmental planning that will be implemented statewide under Executive Order 418. Designed home cistern system that will be used for irrigation and stormwater control.

Senior Engineer (Feb 1995-Feb 2000). Soil and Water Engineering, Gainesville, Florida.

Managed three-person engineering team on water quality projects and water quality model development. Developed field- and farm-scale phosphorus models to evaluate Best Management Practices in the Everglades Agricultural Area (EAAMOD-Field and EAAMOD-Farm). Completed two-dimensional soil nutrient model for high-water table conditions (NUTMOD). Integration of GLEAMS model within a GIS-based water assessment system to evaluate pollution impact on the Suwannee River and St. Johns Rivers (WAM). Developed ArcView interface for WAM. Engineering support activities are listed under Recent Engineering Projects.

Visiting Assistant (Nov 1992-Feb 1995). Agric. Engineering Dept., Univ. of Florida. Supervisor: Ken Boote/Jim Jones.

Managed 10-person technical team for developing the engineering design and data acquisition for controlled environment SPAR chambers and environmental gradient greenhouses used for climate change research. Selected instrumentation and implemented datalogger control algorithms (SPARCTL). Developed and validated crop models for climate change predictions using data from soybean chamber experiments. Developed process and neural-network shooting models for bananas. Added lateral drainage and upward flux components to water balance.

Post-Doctoral Associate (Oct 1989-Oct 1992). Agric. Engineering Dept., Univ. of Florida. Supervisor: Jim Jones.

Managed 3-person multi-institutional software team to create a versatile system (WEATHERMAN) for weather data management and stochastic generation of daily weather data. Developed a canopy evaporation-photosynthesis model suitable for climate change studies (ETPHOT). Instrumented weighing lysimeters and weather station. Measured canopy photosynthesis and evapotranspiration. Validated model and incorporated it into the grain legume model CropGro V.1.0.

SOFTWARE DEVELOPMENT

CNS (Cornell Nutrient Simulation) Model

Developed the weather generator component for the CNS model for use in long-term risk analysis associated with varying weather conditions. Tested the effect of generated versus historic weather on nitrogen and phosphorus loads.

ETPHOT (Evapotranspiration and Photosynthesis Model)

Developed a comprehensive canopy ET and photosynthesis model sensitive to climate changes of carbon dioxide and temperature. Tested model using chamber experimental data.

CROPGRO (Crop Growth Model)

Incorporated the instantaneous ETPHOT model into CROPGRO and evaluated the season-long effects of predicted climate change at various global locations.

WEATHERMAN (Weather Manager or DSS)

Designed and developed a weather data utility or DSS to manage weather data. Program imports, screens, allows graphical inspection, then exports clean data to multiple formats.

SPARCTL (Soil-Plant-Atmosphere-Research Unit Control Program)

Developed control program for eight SPAR units using Campbell Scientific Inc. (CSI) software/hardware hosted on OS/2. Controlled air temperature, dew point, and carbon dioxide concentrations.

EGGCTL (Environmental Gradient Greenhouse Control Program)

Developed control program for four greenhouses using Keithley Metrobyte hardware and Intellution DMACS software. Controlled air temperature gradient and carbon dioxide concentrations.

EAAMOD-FIELD (Field-Scale Everglades Agricultural Area Model)

Co-developer of the field-scale phosphorus and nitrogen transport model for the EAA. Model was developed for two-dimensional flow in organic soils and is used to evaluate field best management practices in the EAA. Developed automated sensitivity analysis and assisted in the Windows interface development.

EAAMOD-FARM (Farm-Scale Everglades Agricultural Area Model)

Developed a farm-scale phosphorus transport model for the EAA. Integrated the DUFLOW canal hydraulic model and a simple field model to allow dynamic input of field lateral drainage and phosphorus loading to the farm canals. Used to evaluate best management practices in the Everglades Agricultural Area at the farm level.

NUTMOD (Field Nutrient Model)

Developed a nitrogen/phosphorus sub-model for EAAMOD-FIELD that is a two-dimensional model designed to deal with both transformations between pools (within a zone) and transport between zones (soil layers and the ditch). Model has four soil layers and handles both the soil and ditch. Model simulates data on any given maximum time step but internally uses a variable time step that is limited but the fastest process for current conditions. Used to evaluate best management practices in the Tri-County Agricultural Area at the farm and basin level.

WAM (Watershed Assessment Model)

Co-developer of the Watershed Assessment Model (WAM) for watershed assessment of water quality (nutrients, BOD, toxins, coliform bacteria, and sediments), flood proneness, wildlife diversity, and wetland value. Model uses GIS for inputs (soil and land use) and to display model outputs. Developed BUCSHELL submodel, a soil-land use shell to run the GLEAMS, EAAMOD-FIELD, and other simpler models for each soil-land use combination. Source results for combination are routed and attenuated to the basin outlet. Model runs on an annual basis for Suwannee River basin (SR-WAM) and on a daily basis for St. Johns River basin (SJ-WAM). The daily version includes a comprehensive stream routing submodel.

CRWM (Charles River Watershed Model)

Developing a combined water quality model for the entire Charles River watershed that will be used to estimate flows and water quality. Parts of the model are being developed separately. CRWA is developing an HSPF water quality model for the upper Charles River and is assisting USGS in the development of a MODFLOW model for the same region. USGS has developed a SWMM model for the urbanized lower Charles River. CRWA will combine these efforts into an integral model to evaluate management for the entire basin.

ACHIEVEMENTS, HONORS AND AWARDS

BS Awards:

Cum Laude with grade point average of 3.8.
Honors for Vectors and Matrices, Theoretical Mechanics, third- and fourth-year studies.
Scholarship from South African Public Commission.
Ford Prestige Award for outstanding academic achievement (final year).
Best BS Agric. Engr. student award from the South African Institute of Agric. Engrs.

MS Awards:

Scholarship from University of Natal.
Grant from Ernest Oppenheimer Memorial Trust Fund.
Special Cornell Assistantship for study period at Utah State Univ.

SOCIETIES

American Society of Agricultural Engineers.
American Geophysical Union.

Peter K. Weiskel, Ph.D.

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EDUCATION:

Boston University Geology Department, Ph.D., 1991. Major specialization: Hydrogeology. Minor specialization: Water Chemistry.

Boston College, Master of Education degree, 1983.

University of Maine (Orono) Geology Department graduate program, 1974-75. Major: Glacial geology. Minor: Geochemistry, Hydrology.

Yale University, Geology & Geophysics Department, B.A., 1974, *cum laude*. Major: Glacial geology. Minor: Geochemistry.

AWARDS AND HONORS: Presidential University Graduate Fellowship, Boston University, 1986-88; Graduate School Prize for Excellence in Teaching, 1988. Guest Investigator, Woods Hole Oceanographic Institution (WHOI), 1987- 1991. USGS/WRD Performance Awards-- 1994, 1995, 2000

PROFESSIONAL SOCIETIES: American Geophysical Union, Society of Wetland Scientists.

RELEVANT PROFESSIONAL EXPERIENCE:

1986-87: Wrote proposal and obtained funding from the U.S. EPA's National Estuary Program for graduate research on subsurface nutrient and microbial transport adjacent to Buzzards Bay, MA. Boston University Geology Dept, Prof. D.W. Caldwell, supervisor.

1987-88: Established cooperative relationship between the Woods Hole Oceanographic Institution Biology Department and the Boston University Geology Department that has yielded 3 completed Ph.D.'s (2 currently USGS employees), and significant published research. (Dr. Brian L. Howes, collaborator, WHOI, Woods Hole, MA. 02543)

1988-92: Served as a Hydrogeologist and Acting Program Manager in the Massachusetts Department of Environmental Protection. (Aquifer Land Acquisition Program, Div. of Water Supply, 1988-90; Ground-Water Regulatory Section, Div. Water Pollution Control, 1990-92). I was responsible for technical review of a variety of ground-water-related reports and projects, including a $2 million subsurface investigation of a proposed wastewater-residuals landfill site for metropolitan Boston. Water Pollution Control Program, Mass. Dept. of Env. Protection, 1 Winter St., Boston, MA 02108.

1992-1997: Research Hydrologist, U.S. Geological Survey, MA-RI District.
• Serve as Chief, Namskaket Marsh Project, a multidisciplinary research project funded cooperatively by USGS, the state of Massachusetts and the Cape Cod Commission, and conducted in

collaboration with university personnel.
• Provide technical assistance to other District projects in the area of wetland hydrology.
• Serve on District workgroups, in Communications/Outreach and Publications.
• Serve as one of two hydrologists on a recently formed, USGS-wide panel charged by the Director with designing a national USGS Coastal Initiative.

1997-2002: Chief, Hydrologic Investigations Section, USGS, MA-RI District.
• Supervise and mentor a staff of 15 Hydrologists, ranging from students to senior level, with a wide range of training and expertise.
• Develop, in collaboration with government agencies and NGOs, new program in ground- and surface-water hydrology, habitat studies, water and sediment quality and urban hydrology.
• Continue research activities in urban and coastal hydrology.

2002-present: Program Officer, USGS, MA-RI District.
• Oversee the the development of new USGS water-resources projects in MA and RI.
• Represent the USGS to government agencies, NGOs, and the university community in MA and RI.
• Continue research in urban hydrology, bacterial source tracking, and coastal hydrology.

BIBLIOGRAPHY *(selected)*

1. Published reports and journal papers (selected):

Weiskel, P.K., and Howes, B.L., 1991, Quantifying dissolved nitrogen flux through a coastal watershed: Water Resources Research, v. 27, no. 11, p. 2929-2939.

Weiskel, P.K., and Howes, B.L., 1992, Differential transport of sewage-derived nitrogen and phosphorus through a coastal watershed: Environmental Science and Technology, v. 26, no. 2, p. 352-360.

Weiskel, P.K., Howes, B.L., Smith, J.B., and DeSimone, L.A., 1995, Hydrogeologic field methods for coastal wetlands investigations, Proceedings, Society of Wetlands Scientists 16th Annual Meeting, Cambridge, MA, May 29 - June 1, 1995, p. 60-61.

Weiskel, P.K., DeSimone, L.A., and Howes, B.L., 1996, A nitrogen-rich septage-effluent plume in a coastal aquifer, marsh, and creek system, Orleans, Massachusetts, 1988-95: Project summary: U.S. Geological Survey Open-File Report 96-111, 20 p.

Weiskel, P.K., and Howes, B.L., 1996, Coliform contamination of a coastal embayment: Sources and transport pathways: Environmental Science and Technology, v. 30, no 6, p. 1872-1881.

Howes, B.L., **Weiskel, P.K.**, Goehringer, D.D., and Teal, J.M., 1996, Interception of freshwater and transport of nitrogen from uplands to coastal waters: The role of salt marshes: *in* Nordstrom, K.F., and Roman, C.T, eds., *Estuarine Shores: Evolution, Environments, and Human Alterations,* John Wiley & Sons, Chichester, UK., 486 p.

Lent, R.M., **Weiskel, P.K.**, Lyford, F.P., and Armstrong, D.S., 1997, Hydrologic indices for non- tidal wetlands: Wetlands, v. 17, no. 1 (March 1997), p. 19-30.

Weiskel, P.K., DeSimone, L.A., and Howes, B.L., 1997, The Namskaket Marsh Project: Nitrogen transport and ecosystem characterization in a Cape Cod aquifer and salt marsh: Environment Cape Cod, v. 1, no. 2.p. .

Breault, R.F., **Weiskel, P.K.**, and McCobb, T.D., 1998, Channel morphology and streambed-sediment quality in the Muddy River, Boston and Brookline, Mass., October 1997, USGS Water- Resources Investigation Report 98-4027.

Breault, R.F., Reisig, K.R., Barlow, L.K., and **Weiskel, P.K.,** 2000, Distribution and potential for adverse biological effects of inorganic elements and organic compounds in bottom sediment, Lower Charles River, Massachusetts, USGS Water-Resources Investigations Report 00-4180.

Breault, R.F., Sorenson, J.R., and **Weiskel, P.K.**, 2002, Streamflow, water quality, and contaminant loads in the lower Charles River watershed, Massachusetts, 1999-2000, U.S. Geol. Survey Water-Resources Investigations Report 02-4137, 131 p.

Zarriello, P.J., Breault, R.F., and **Weiskel, P.K.**, 2002, Potential effects of structural controls and street sweeping on stormwater loads to the lower Charles River, Massachusetts, U.S. Geol. Survey Water-Resources Investigations Report 02-4220.

2. Published abstracts (selected):

Weiskel, P.K., Heufelder, G.H., and Howes, B.L., 1989, Impact of septic systems on ground- water quality, Buttermilk Bay drainage basin. 1. Indicator Bacteria: 1989 Annual Buzzards Bay Symposium, U.S. EPA, Region I. (Abstract presented at Annual Symposium of the National Estuary Program's Buzzards Bay Project, held at Woods Hole Oceanographic Institution, Woods Hole, Mass.)

3. Unpublished academic theses

Weiskel, P.K., 1974, The origin and post-glacial history of Androscoggin Lake, Maine: B.A. Thesis, Geology and Geophysics Department, Yale University.

Weiskel, P.K., 1991, Septic effluent and ground-water quality, Buttermilk Bay Drainage Basin, Massachusetts: Ph.D. Dissertation, Geology Department, Boston University.